

that second interference fringes produced by interference of light diffracted from said second transmission type hologram and the reference light incident on said photosensitive material are recorded in said photosensitive material.

30. (Amended) A method of fabricating a hologram-recorded medium which is an imagewise or other pattern-recorded medium comprising a collection of pixels, and in which any one of a plurality of volume type diffraction gratings comprising volume holograms and differing from each other is assigned to at least a part of said pixels, [characterized by] the method comprising:

stacking a [volume hologram] photosensitive material, capable of recording a volume hologram, on a transmission type hologram, [and]

striking reconstructing illumination light of given wavelength on a side of said transmission type hologram that is not opposite to said [volume hologram] photosensitive material, so that interference fringes produced by interference of light diffracted from said transmission type hologram and zero-order transmitted light of said reconstructing illumination light are recorded in said [volume hologram] photosensitive material, [followed by provision of] and

providing a reflecting layer on a back(side of said [volume hologram] photosensitive material.

Please add the following new claim:

A 2
--62. The method set forth in claim 28, wherein said filtering higher order diffracted light from reflecting back to said photosensitive material is accomplished using a dichroic filter disposed between said reflection type relief hologram and said photosensitive material.--

REMARKS

General remarks:

Applicants thank the Examiner for acknowledging Applicants' claim to foreign priority and receipt of the certified copies of the foreign priority documents.

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In the Office Action, the Examiner acknowledges Applicants' election of claims 28-30 and 34 to invention Group IV of species (A) in Paper No. 7, and has withdrawn claims 1-27, 31-33 and 35-61 from consideration. Additionally, the Examiner alleges that claim 34 does not read on the elected species which uses a hologram means to fabricate a hologram; therefore, the Examiner has also withdrawn claim 34 from consideration.

The Examiner has objected to the Abstract as not reflecting the technical features of the invention. Included with this Amendment is a new Abstract which is believed to reflect the technical features of the invention.

Claims 28-30 have been rejected under 35 U.S.C. § 112, second paragraph, as being indefinite. Specifically, the Examiner does not recognize the term "volume hologram photosensitive material". Claims 28, 29 and 30 are amended to delete the term "volume hologram photosensitive material", and to instead recite "a photosensitive material, capable of recording a volume hologram."

Claims 28 and 30 stand rejected under 35 U.S.C. § 103 as being unpatentable over USP 5,781,317 issued to Kawazoe et al. Claim 29 stands rejected under 35 U.S.C. § 103 as being unpatentable over USP 5,473,447 issued to Molteni et al. These rejections are respectfully traversed.

Discussion of the art rejections:

The invention

The invention is directed to a method of fabricating a hologram having a pattern made up of pixels in which a photosensitive material for forming a hologram is stacked on either a reflection-type hologram or a transmission type hologram. According to one aspect of the invention shown in Fig. 18(a), the photosensitive material (107) is stacked on a reflection-type relief hologram (106) and reconstructing illumination light (108) of a given wavelength is struck on the reflection-type relief hologram through the photosensitive material, so that interference fringes produced by interference of the light diffracted from the reflection type relief hologram

and the incident light are recorded in the photosensitive material. A dichroic filter (110), capable of cutting higher order diffracted light from striking on the reflection type hologram (106) at angles different from those of the incident light 108 and first-order diffracted light (109), may be interposed between the reflection type hologram (106) and the photosensitive material (107). (For a description of the first aspect of the invention, see page 56, line 5 to page 57, line 3 of the specification.)

According to a second aspect of the invention shown in Fig. 18(b), the photosensitive material (107) is stacked on a transmission-type hologram (106'), and reconstructing illumination light (108) of a given wavelength is struck on a side of the transmission type hologram that is not opposite to the volume hologram photosensitive material, so that interference fringes produced by interference of light diffracted from the transmission type hologram and reference light incident on the photosensitive material are recorded in the photosensitive material. A dichroic filter (110), capable of cutting zero order diffracted light and higher order diffracted light striking on the reflection type hologram (106') at an angle different from that of first-order diffracted light (109), may be interposed between the reflection type hologram (106') and the photosensitive material (107). (For a description of the second aspect of the invention, see page 57, line 4 to page 58, line 2.)

According to a third aspect of the invention shown in Fig. 18(c), the photosensitive material (107) is stacked on a transmission type hologram (106'), and reconstructing illumination light (108) of a given wavelength is struck on a side of the transmission type hologram that is not opposite to the photosensitive material, so that interference fringes produced by interference of light (109) diffracted from the transmission type hologram and zero-order transmitted light (112) are recorded in the photosensitive material, and a reflecting layer is provided on a back side of the photosensitive material. (For a description of this aspect of the invention, see page 58, lines 3 to 28.)

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The rejection of claims 28 and 30

The Examiner rejected claims 28 and 30 under 35 U.S.C. § 103 as being unpatentable over USP 5,781,317 issued to Kawazoe et al. According to the Examiner's analysis, Fig. 37 and columns 18 and 19, and Figs. 18(a) and 18(b) and columns 12 and 13 of Kawazoe et al disclose all the limitations of these claims except for the specific steps for making a plurality of holographic elements. However, the Examiner asserts that it appears that making a plurality of holographic elements would require the same steps as making a single holographic element. From this, the Examiner concludes that making a plurality of holographic elements does not impart patentability to the claims.

With respect to claim 28, Applicants submit that Kawazoe et al does not render this claim obvious at least because Kawazoe et al fails to teach or suggest a method which includes the claimed step of filtering higher order ~~diffracted~~ light from reflecting back to the photosensitive material.

With respect to claim 30, in order to assist the Examiner's understanding of how this claim differs from the teaching of Kawazoe et al, Kawazoe et al will be compared with the third aspect of the invention discussed above and shown in Fig. 18(c), in which reconstructing illumination light (108) of a given wavelength is struck on a side of the transmission type hologram that is not opposite to the photosensitive material, so that interference fringes produced by interference of light (109) diffracted from the transmission type hologram and zero-order transmitted light (112) are recorded in the photosensitive material. In rejecting claim 30, the Examiner relies on Figs. 18(a) and 18(b) of Kawazoe et al as showing reflected diffracted light (2143 in Fig. 20) interfering with incident zero order diffracted light (2141 in Fig. 20) in the photosensitive plate 2013 to form interference fringes which are recorded in the photosensitive plate.

However, the arrangement of Figs. 18(a) and 18(b) of Kawazoe et al is different from the arrangement of Fig. 18(c) of the present application, at least because in Fig. 18(c) the reconstructing light passes through the transmission type hologram 106', which splits the

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reconstructing light into first order diffracted light 109 and zero order diffracted light 112. After emerging from the transmission type hologram 106', the first order diffracted light 109 and the zero order diffracted light 112 interfere to form interference fringes which are recorded in the photosensitive material 107.

That is, according to the third aspect of the invention, the reconstructing light from which both the first order diffracted light 109 and the zero order diffracted light 112 are formed strikes a side of the transmission type hologram that is not opposite to the photosensitive material, but according to Kawazoe et al, the zero order light strikes a side of the transmission type hologram that is opposite the photosensitive material. The method of claim 30 is believed to distinguish over Kawazoe et al at least because this reference fails to teach or suggest a method which includes a step of "striking reconstructing illumination light of given wavelength on a side of said transmission type hologram that is not opposite to said photosensitive material, so that interference fringes produced by interference of light diffracted from said transmission type hologram and zero-order transmitted light of said reconstructing illumination light are recorded in said photosensitive material."

The rejection of claim 29

The Examiner rejected claim 29 under 35 U.S.C. § 103 as being unpatentable over USP 5,473,447 issued to Molteni et al. According to the Examiner's analysis, Fig. 6 and columns 13 and 14 of Molteni et al disclose all the limitations of this claim except that the recording plate is formed of photosensitive material. However, the Examiner asserts that it is well known to use photosensitive material as a hologram recording medium. Additionally, the Examiner admits that Molteni et al does not disclose that the produced hologram is a volume hologram, but the Examiner finds this to have been an obvious difference.

In response, Applicants submit that the method of claim 29 is not rendered obvious by Molteni et al at least because Molteni et al fails to teach or suggest the claimed step of "replacing said first transmission type hologram with a second transmission type hologram having a second pattern of interference fringes and striking the reconstructing light on a side of said second

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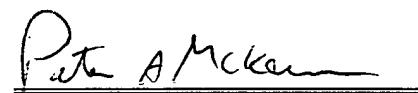
transmission type hologram that is not opposite to said photosensitive material, so that second interference fringes produced by interference of light diffracted from said second transmission type hologram and the reference light incident on said photosensitive material are recorded in said photosensitive material." An example of this step is described with respect to the second aspect of the invention. For example, in the specification at page 57, lines 15 to 24, a second transmission type hologram 106' replaces the first transmission type hologram 106' so that different interference fringes are recorded in the photosensitive material.

Conclusion and request for telephone interview:

Applicants respectfully request the Examiner to withdraw all objections and rejections, and to find the application now to be in condition for allowance. If the Examiner feels that the disposition of the application could be expedited by speaking with Applicant's representative, the Examiner is respectfully invited to **call the undersigned attorney** at the number shown below.

Applicant hereby petitions for any extension of time which may be required to maintain the pendency of this case, and any required fee, except for the Issue Fee, is to be charged to Deposit Account No. 19-4880.

Respectfully submitted,


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